

Applicant(s): Rainer Pommersheim
Application No.: Unassigned
Filing Date: Herewith
Docket No.: 1374-3 PCT/US
Page 2

AMENDMENTS TO THE CLAIMS:

1. (Original) A microcapsule, especially for immobilizing solids, liquids, cells, microorganisms and/or mixtures from these materials for use in chemistry, food technology and/or pharmacy, comprising a preferably spherical core containing the material to be immobilized and preferably an envelope enclosing the same, characterized in that

the capsule is stable when stored in a concentrated medium and, upon the dilution of the same, is destroyed already under a small mechanical stress,

the material to be immobilized is completely enclosed by the matrix (the capsule core) ,

the capsule core may be surrounded by a multilayer envelope completely enclosing the same,

the envelope contains at least one layer covalently and/or electrostatically bonded to the adjacent one underneath and/or above the same,

at least one layer of the envelope is applied to the capsule core by coating with a solid,

at least one layer of the envelope is formed on the capsule core by a membrane-forming liquid,

at least one layer of the envelope is formed by both complexing and coating.
2. (Original) A microcapsule according to claim 1, characterized in that

the substance forming the core matrix is a substance of which drops can be produced,

from which preferably spherical particles can be formed by means of a precipitation through the influence of ions or a temperature gradient.

3. (Currently Amended) A microcapsule according to claim 1 ~~or 2~~, characterized in that the substance surrounding the material to be immobilized in the interior of the core matrix may be an oil or another liquid immiscible with the matrix substance such as a hydrocarbon, a hydrocarbon mixture.
4. (Currently Amended) A microcapsule according to ~~one of claims 1 to 3~~ claim 1, characterized in that the material to be immobilized forms a suspension with a second substance disposed in the interior of the capsule, which forms a phase boundary with the matrix substance.
5. (Currently Amended) A microcapsule according to ~~one of claims 1 to 4~~ claim 1, characterized in that the material to be immobilized forms a liquid/liquid emulsion with a second substance disposed in the interior of the capsule, which forms a phase boundary with the matrix substance.
6. (Currently Amended) A microcapsule according to ~~one of claims 1 to 5~~ claim 1, characterized in that the core matrix or at least one phase in the capsule core contains a solid.
7. (Currently Amended) A microcapsule according to ~~one of claims 1 to 6~~ claim 1, characterized in that at least one phase in the capsule core contains a liquid.

Applicant(s): Rainer Pommersheim
Application No.: Unassigned
Filing Date: Herewith
Docket No.: 1374-3 PCT/US
Page 4

8. (Currently Amended) A microcapsule according to ~~one of claims 1 to 7~~ claim 1, characterized in that
at least one phase in the capsule core contains cells.
9. (Currently Amended) A microcapsule according to ~~one of claims 1 to 8~~ claim 1, characterized in that
at least one phase in the capsule core contains microorganisms.
10. (Currently Amended) A microcapsule according to ~~one of claims 1 to 9~~ claim 1, characterized in that
the coating of the capsules is accomplished in a fluidized-bed process.
11. (Currently Amended) A microcapsule according to ~~one of claims 1 to 10~~ claim 1, characterized in that
it can be dried without suffering significant losses of functionality.
12. (Currently Amended) A microcapsule according to ~~one of claims 1 to 11~~ claim 1, characterized in that
the drying of the capsules is accomplished in a fluidized-bed process.
13. (Currently Amended) A microcapsule according to ~~one of claims 1 to 12~~ claim 1, characterized in that
while its drying in a fluidized-bed process, a solid is additionally blown into the column which forms a membrane on the capsule surface.
14. (Currently Amended) A microcapsule according to ~~one of claims 1 to 13~~ claim 1, characterized in that
all materials from which it is formed may be food-approved.

Applicant(s): Rainer Pommersheim
Application No.: Unassigned
Filing Date: Herewith
Docket No.: 1374-3 PCT/US
Page 5

15. (Currently Amended) A microcapsule according to ~~one of claims 1 to 14~~ claim 1, during the production of which some, several or all of the following steps are performed, of which some steps may also be repeated several times:
- dissolving or suspending the material to be encapsulated in a base material
 - producing drops of this base material suspension or solution
 - precipitating the drops
 - sealing the drops with the simultaneous precipitation by flowing round the globules in a precipitation bath which also contains an ionic polymer solution in addition to the precipitating reagent
 - rinsing and suspending the globules formed by the precipitation in a washing liquid
 - flowing round the globules with a cationic or anionic polymer solution and forming a cationic or anionic charge on the surface of the sphere
 - washing the globules with a washing liquid
 - flowing round the globules with an anionic or cationic polymer solution and
 - forming an ionic or cationic charge on the surface of the sphere
 - rinsing and suspending the globules formed by the precipitation in a washing liquid
 - drying the globules
 - placing (suspending) the dried globules in a concentrated medium such as a gel
 - storing the globules in this concentrated medium over a certain period.
16. (Currently Amended) A microcapsule according to ~~one of the preceding claims~~ claim 1, characterized in that
- the deliberate destruction of the capsule is achieved if complexing agents in the medium surrounding the capsule matrix extract ions from the same and destabilize the capsule.

17. (Original) A microcapsule, especially for immobilizing solids, liquids, cells, microorganisms and/or mixtures from these materials for use in chemistry, food technology and/or pharmacy, comprising a preferably spherical core containing the material to be immobilized and preferably an envelope enclosing the same, characterized in that
- the capsule is stable when stored and contains at least one component resulting in a destruction of the capsule and release of the encapsulated material by a later change of the physical and/or chemical parameters of the surrounding medium,
- the component contained in the capsule, resulting in a destruction of the capsule and release of the encapsulated material by a later change of the physical and/or chemical parameters of the surrounding medium, is an enzyme capable of breaking down specific substances of the capsule matrix and/or the capsule membrane,
- the component contained in the capsule, resulting in a destruction of the capsule and release of the encapsulated material by a later change of the physical and/or chemical parameters of the surrounding medium, is a substance that can be broken down by an enzyme contained in the capsule,
- the component contained in the capsule, resulting in a destruction of the capsule and release of the encapsulated material by a later change of the physical and/or chemical parameters of the surrounding medium, is a substance that can be precipitated in a reversible process by the influence of ions,
- the material to be immobilized is completely enclosed by the matrix (the capsule core),
- the capsule core may be surrounded by a multilayer envelope completely enclosing the same,

wherein the envelope contains at least one layer covalently and/or electrostatically bonded to the adjacent one underneath and/or above the same,

at least one layer of the envelope is applied to the capsule core by coating with a solid,

at least one layer of the envelope is formed on the capsule core by a membrane-forming liquid, and/or

at least one layer of the envelope is formed by both complexing and coating.

18. (Original) A microcapsule according to claim 17,
characterized in that
the substance forming the core matrix is a substance of which drops can be produced,
from which preferably spherical particles can be formed by means of a precipitation
through the influence of ions or a temperature gradient.
19. (Currently Amended) A microcapsule according to claim 17 ~~or 18~~,
characterized in that
the substance surrounding the material to be immobilized in the interior of the core
matrix may be an oil or another liquid immiscible with the matrix substance such as a
hydrocarbon, a hydrocarbon mixture.
20. (Currently Amended) A microcapsule according to ~~one of claims 17 to 19~~ claim 17,
characterized in that
the material to be immobilized forms a suspension with a second substance disposed in
the interior of the capsule, which forms a phase boundary with the matrix substance.
21. (Currently Amended) A microcapsule according to ~~one of claims 17 to 20~~ claim 17,

characterized in that

the material to be immobilized forms a liquid/liquid emulsion with a second substance disposed in the interior of the capsule, which forms a phase boundary with the matrix substance.

22. (Currently Amended) A microcapsule according to ~~one of claims 17 to 21~~ claim 17, characterized in that
the core matrix or at least one phase in the capsule core contains a solid.
23. (Currently Amended) A microcapsule according to ~~one of claims 17 to 22~~ claim 17, characterized in that
at least one phase in the capsule core contains a liquid.
24. (Currently Amended) A microcapsule according to ~~one of claims 17 to 23~~ claim 17, characterized in that
at least one phase in the capsule core contains cells.
25. (Currently Amended) A microcapsule according to ~~one of claims 17 to 24~~ claim 17, characterized in that
at least one phase in the capsule core contains microorganisms.
26. (Currently Amended) A microcapsule according to ~~one of claims 17 to 25~~ claim 17, characterized in that
the coating of the capsules is accomplished in a fluidized-bed process.
27. (Currently Amended) A microcapsule according to ~~one of claims 17 to 26~~ claim 17, characterized in that
it can be dried without suffering significant losses of functionality.

Applicant(s): Rainer Pommersheim
Application No.: Unassigned
Filing Date: Herewith
Docket No.: 1374-3 PCT/US
Page 9

28. (Currently Amended) A microcapsule according to ~~one of claims 17 to 27~~ claim 17, characterized in that the drying of the capsules is accomplished in a fluidized-bed process.
29. (Currently Amended) A microcapsule according to ~~one of claims 17 to 28~~ claim 17, characterized in that while its drying in a fluidized-bed process, a solid is additionally blown into the column which forms a membrane on the capsule surface.
30. (Currently Amended) A microcapsule according to ~~one of claims 17 to 29~~ claim 17, characterized in that all materials from which it is formed may be food-approved.
31. (Currently Amended) A microcapsule according to ~~one of claims 17 to 30~~ claim 17, during the production of which some, several or all of the following steps are performed, of which some steps may also be repeated several times:
- dissolving or suspending the material to be encapsulated in a base material
 - adding an enzyme capable of breaking down specific components of this mixture and/or capsule coating
 - producing drops of this base material suspension or solution
 - precipitating the drops
 - sealing the drops with the simultaneous precipitation by flowing round the globules in a precipitation bath which also contains an ionic polymer solution in addition the precipitating reagent
 - rinsing and suspending the globules formed by the precipitation in a washing liquid
 - flowing round the globules with a cationic or anionic polymer solution and forming a cationic or anionic charge on the surface of the sphere

Applicant(s): Rainer Pommersheim
Application No.: Unassigned
Filing Date: Herewith
Docket No.: 1374-3 PCT/US
Page 10

- washing the globules with a washing liquid
- flowing round the globules with an anionic or cationic polymer solution and forming an ionic or cationic charge on the surface of the sphere
- rinsing and suspending the globules formed by the precipitation in a washing liquid
- drying the globules
- placing (suspending) the dried globules in a concentrated medium such as a gel
- storing the globules in this concentrated medium over a certain period.